AN ANALYSIS OF VARIATIONS ON ALBANY SLIP

A Report

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Problems in Art Education

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by

Marvin C. Muyres

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PREFACE

The purpose of this paper is to analyze results of experiments consisting of the subjection of Albany clay, a natural slip glaze (clay suspended in water) found near Albany, New York, to a variety of roles as related to the glaze process within the temperature range of cone 8 to 10, (2305° to 2381° Farenheit).

Deposits of slip clay containing the necessary fluxes to function as a glaze occur in natural form throughout the northern states. The most widely known commercially prepared slip clay glazes are found in Albany, New York, Rowley, Michigan and on a non-commercial basis near Wrenshall, Minnesota.

Conclusions will be based on a selection of tiles from the initial 200 unit study including 4 stoneware clay bodies, a porcelain clay body and a variety of surface treatments fired in the reduction atmosphere of a gas kiln over a period of 14 hours.

I wish to express my sincere appreciation to members of the Art Department at the University of Minnesota, Duluth, for their cooperation and encouragement and in particular, Professor Arthur E. Smith, Chairman of the Art Department, and Professor Glenn C. Nelson, Ceramics Instructor.

INTRODUCTION

Present day society in its search for answers concerning the history of man, relies on permanent artifacts which have withstood the physical elements over many thousands of years.

The establishment of the ceramic process can be traced solely through the study of areas yielding evidence generally involving organized burials and discards of early nomadic peoples.

The use of fire hardened clay dates back to 5000 B.C., in the area known today as Egypt. Specifically, clay slip decorated ceramic vessels are traced as far back as 5000 B.C. to the Harappa sites in India.[1]

Throughout history, evidence of the use of clay slip and clay slip glazes, as a decorative sealing process has been found in many parts of the world. This paper will be concerned with the period of time following the European settlement in North America.

Settlers took into consideration the various clay deposits of a general area and through their ingenuity gave way frequently to beautifying utilitarian wares. Clays peculiar to a region, by necessity, dictated the earliest of clay slip color variations.

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[1]Glenn C. Nelson, Ceramics, (New York: Holt, Rhinehart and Winston, 2nd Edition 1966), p. 2.

Eventually, through the process of trial and error, it was noted that distinct variations could be achieved by blending types of clays and adding material such as crude metallic oxides to them.

The first pottery was established by Daniel Cox at Burlington, New Jersey, in 1684, opening the era of early American pottery.

Four types of clay bodies: redware, stoneware, brownware, and yellow-ware in use at that time were found coated in a variation of lead base glazes related to the backgrounds of the traditionally trained potters and proximity of raw materials. Actual dates are vague, since early forms of pottery, such as redware, seldom bore marks of the maker's identity. The use of Albany slip in combination with salt glaze in America can be traced to the mid-seventeen hundreds, with European (Rhineland) traditions reaching back to the fourteen hundreds.

Stoneware first appeared about 1864 in Burlington, New Jersey. Because it was more durable and practical, stoneware replaced redware as the popular clay body. In some Pennsylvania Dutch locales people, however, continued to use redware. This change can be categorized as the transitional or first evidence of industrialization.

Brownware, introduced about 1830, was generally glazed with Albany slip, ranging from transparent glossy browns to the less carefully fired dull stony surfaces.

Yellow-ware refers to a light yellow or buff clay body to which

clear lead and alkaline glazes were applied which intensified the body color. With the advent of industrialization and a growing knowledge of chemistry, specializations in the various phases of the ceramic process render natural (sometimes inconsistent) materials, obsolete. Such may have been the case with Albany slip (in relation to industrial production) where constant quality control did not permit the variation evident in natural raw material availability. Consistency is one of industry's demands for calculated production, and that which was once a mainstay, is now unacceptable. Nevertheless, Albany slip has maintained a consistency acceptable to studio potters who welcome slight variation between pieces for the purpose of individuality.

Albany slip, in many cases the main glaze ingredient used by the early American potters, provided an adequate surface with minimum preparation. It could be applied to damp unfired clay (leather hard) for a single-fire process or to the low-fired bisque ware followed by a glaze firing. Considering the unrefined kilns of the early American potters, Albany slip with its wide firing range, durability, visual appeal, and availability, has served and is continuing to serve its craftsmen and consumers well.

CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

Slip clay glazes have been used by potters for centuries much as they are when removed from the earth's surface.

General information concerning Albany slip and glaze techniques can be found in various publications; however, the nature of the information is generally limited to the direct application of unaltered Albany slip to a surface as an underglaze or an overglaze material.

Potters often explore a phase of slip glazing peculiar to their geographic location, but this information seldom reaches print.

I. THE PROBLEM

Statement of the Problem. The purpose of this study was to offer insights into a multi-purpose use of Albany slip, through: (1) selecting major chemical flux groups commonly used as additives to base Albany slip; (2) modifying Albany slip (slip trail) to function as a stain by the use of chemical colorants; (3) combining equal portions of base cone 10 studio glazes; (4) decorative surface treatment on 3 selected clay bodies; (5) stained porcelain slip applications on bisque stoneware surfaces; (6) white porcelain used as a stain with Albany slip; (7) treatment of Albany slip surface with base studio glaze stain.

Importance of the study. Due to the basic cost and transportation fees, a broad array of chemicals is not always available to the potter or instructor. Consequently the breadth of this research extends the use of common accessible materials. The intent of this paper is to determine some of the limitations inherent in Albany slip in combination with colorants and a select group of studio glazes.

II. DEFINITIONS OF TERMS USED

Albany slip. A natural clay containing sufficient fluxes to melt and function as a glaze. It develops a dark brown-black glaze at cone 8-10 without any additions. Since it is mined in several localities in the vicinity of Albany, New York, its composition may vary slightly from time to time. Similar clays, found in various sections of the country, were much used by early American stoneware potteries.

bag wall. A baffle wall separating kiln chamber from combustion area.

biscuit or bisque. Unglazed low-fired ware.

clay. Basically, a decomposed granite-type rock. To be classed as a clay the decomposed rock must have fine particles so that it will be plastic. They are classified into various types, such as ball clays, fire clays, and slip clays.

flux. Lowest-melting compound in a glaze such as lead, borax, soda ash, or lime and including the potash or soda contained in the feldspar. The flux combines easily with silica and thereby helps break the higher-melting alumina-silica compounds eventually to form a glass.

The definitions of these terms are from Glenn C. Nelson, Ceramics, (New York: Holt, Rhinehart and Winston, 2nd Edition 1966), pp. 311-322.

frit. A partial or complete glaze which is melted and then reground for the purpose of eliminating the toxic effects of lead or the solubility of borax, soda ash, and so forth.

glaze. A liquid suspension of finely ground minerals which is applied by brushing, pouring, or spraying on the surface of bisque-fired ceramic ware. After drying the ware is fired to the temperature at which the glaze ingredients will melt together to form a glassy surface coating.

kaolin. Pure clay, also known as china clay. It is used in glaze and porcelain bodies and fires out to a pure white.

mat glaze. A dull-surfaced glaze with no gloss but pleasant to the touch, not to be confused with an incompletely fired glaze. Mat surfaces may be developed by the addition of barium carbonate, or alumina, and a slow cooling cycle.

overglaze colors. Colors containing coloring oxides or ceramic stains, a flux, and some type of binder.

porcelain. (Chinese) A hard, non-absorbent clay body, white or gray in color, which rings when struck.

pyrometric cones. Small triangular cones (1 1/8 and 2 5/8 inches in height) made of ceramic materials which are compounded to bend and melt at specific temperatures, thus enabling the potter to determine when the firing is complete.

reduction fire. A firing using insufficient oxygen; carbon monoxide thus formed unites with oxygen from the body and glaze to form carbon dioxide, producing color changes in coloring oxides.

salt glaze. A glaze developed by throwing salt (NaCl) into a hot kiln. The salt vaporizes and combines with the silica in the body to form sodium silicate, a hard glassy glaze. A salt kiln is of a slightly different construction and is limited in use to the salt glaze.

slip. A clay in liquid suspension.

slip clay. A clay such as Albany and Michigan clays containing sufficient fluxes to function as a glaze with little or no additions.

stain. Sometimes a single coloring oxide, but usually a combination of oxides, plus alumina, flint, and a fluxing compound.

trailing. A method of decorating, using a slip trailed out from a rubber syringe.

underglaze. Colored decoration applied on the bisque ware before the glaze is applied.

viscosity. The nonrunning quality of a glaze, caused by glaze chemicals which resist the flowing action of the glaze flux.

CHAPTER II

CHARACTERISTICS OF FIVE CLAY BODIES

Clay Body "A": (Orange)

Clay body "A" was selected because of an open quality resulting from an addition of silica sand. The shrinkage factor is not objectionable and fissures through shrinkage rarely appear (as they did in more dense stoneware bodies).

An addition of 2 per cent red iron oxide enhances the color in a reduction atmosphere.

The formula is as follows:

17	Fire Clay (Cedar Heights)
50	Ball Clay (Kentucky)
22	Flint Sand (Minnesota)
11	Feldspar Potash (Custer)
2	Red Iron Oxide
2	Ochre

Clay Body "B": (Black)

Clay body "B" is similar in composition to clay body "A" with the exception of an 8 per cent addition of red iron oxide. It varies between a deep brown and metallic black. The effect on a glaze and

slip is very prominent.

The formula is as follows:

17	Fire Clay (Cedar Heights)
50	Ball Clay (Kentucky)
22	Flint Sand (Minnesota)
11	Feldspar Potash (Custer)
8	Red Iron Oxide
2	Ochre

Clay Body "C": (Grey Stoneware Clay)

The following stoneware clay body is described by its title. The prime element is a true stoneware clay, referred to as Jordan Stoneware. To insure plasticity, proper fit of glazes and body fusion, ball clay, flint and feldspar were added.

As a result, the Jordan body is very plastic, dense, and stony grey in appearance.

The formula is as follows:

70	Jordan (New Jersey)
20	Ball Clay (Kentucky)
5	Feldspar (Custer)
5	Flint (Minnesota)

Clay Body "D": (Fire Clay - Warm Orange)

This clay body is composed largely of medium coarse fire clay, ball clay, and an addition of feldspar.

The general throwing qualities, effect on glazes, and warm orange body color, in a reducing atmosphere, are excellent.

The formula is as follows:

60	Fire Clay (Mexico, Missouri)
40	Ball Clay (Kentucky)
10	Feldspar (Custer)

Clay Body "E": (White Porcelain)

Porcelain clay lacks the plasticity of stoneware, but if it is aged properly and color is compromised by the addition of ball clay, a suitable body is achieved.

The formula is as follows:

15	Flint (Minnesota)
15	Feldspar (Custer)
45	Kaolin (Georgia)
25	Ball Clay (Kentucky)

This body composition aided in the development of color not usually known to the stoneware potter.

The preceding clay bodies provide a random clay sampling (in relation to several glazes), and in no way attempt to exhaust the possibilities.

Varying the temperature range, altering the clay bodies and modifying the glazes will produce another series of results.

CHAPTER III

AN ANALYSIS OF EIGHT SELECT GLAZES

A general description and formula of the base glazes used in conjunction with Albany slip will be included for the information of the reader.

Barium Glaze

The use of barium as a flux (depending upon the quantity) promotes a hard stone to waxy sheen surface. With the addition of zinc, rutile, and a heavy reduction, a pleasingly mottled surface can be achieved.

50	Feldspar
20	Barium
8	Whiting
10	Ball Clay
8	Zinc
2	Rutile

Cornwall Stone Glaze

The cornwall stone base glaze offers a semi-gloss, nearly opaque quality when applied thickly and tends to be slightly fluid when active oxides are added.

70	Cornwall Stone
20	Whiting
10	Kaolin
10	Talc
0.5	Bone Ash

Stone Mat Magnesia Glaze

The magnesia stone mat glaze has a high clay content permitting a wide firing range. A thin coating is desirable in that slight crazing will result, due to lack of silica. A mottled surface develops from an influence of the clay body and is further enhanced by an addition of granular ilmenite or a similar substitute.

56	Feldspar Potash
14	Dolomite
3	Whiting
26	Kaolin
10	Talc
3	Ilmenite

Subtle Yellow Magnesia Glaze

Much like the preceding glaze this subtle yellow glaze is very stable. Silica crazing is at a minimum and a soft mottled mat surface develops with the addition of rutile.

25	Feldspar (Custer)
33	Dolomite
4	Whiting
33	Kaolin
7	Flint
1	Copper Carbonate
1	Rutile

Riverstone Mat Glaze

The simplicity and flexibility of this glaze is of great interest. When applied thinly, the throw rings are intensified with an orange cast settling at the base, and when thickly applied, a wholesome opaque mat surface results. This glaze is very stable.

50	Feldspar Potash
25	Ball Clay
23	Dolomite
3	Whiting

Red Plum Glaze

Red plum glaze with a small amount of iron oxide develops a stable translucent celadon glaze. An addition of 8 per cent Spanish red iron oxide forms an iridescent, somewhat fluid, rich brown maroon.

42	Feldspar (Custer)
4.4	Dolomite
11.3	Whiting
13.5	Kaolin
1	Zinc Oxide
27.8	Flint
1	Red Iron Oxide

Soft Red Glaze

Soft red glaze can be applied thinly to reveal the clay body. With 8 per cent red iron oxide in the glaze, the tile surface has a mottled reddish quality.

Bone ash and talc contribute to the pleasant smooth surface when the application is thick. When the placement is near the flame, an olive to purple red breaks at each throw ring.

52.7	Feldspar
21.3	Whiting
4	Bone Ash
25	Kaolin
4	Talc
8	Iron

Soft Yellow Red Glaze

Soft yellow red glaze, with 4 per cent red iron oxide develops a light khaki green with red dappling.

52.7	Feldspar
21.3	Whiting
4	Bone Ash
25	Kaolin
4	Talc
4	Iron

CHAPTER IV

INTRODUCTION OF FLUX ELEMENTS TO ALBANY SLIP

Listed below is a comparative chart of the major flux additives.

Table 1 - Major Flux Additions to Albany Slip Totaling 100%

% Added to Albany Slip	5	10	15	20	25	30	35	40	45	50
Whiting				X				X		
Barium					X					X
Dolomite				X				X		
Colemenite					X					X
Borax	X				X					X
3191 Frit					X					X
Cornwall Stone				X				X		
Nepheline Syenite			X			X				
Wood Ash					X					X
Feldspar				X				X		
Talc				X				X		

Application of the experimental glaze was carried out on a fire clay body tile (clay body "D") with a large glaze-loaded brush stroked vertically and horizontally. Placement of the tiles was at a 45 degree angle and centered in the kiln at a safe distance from the baffle wall. A reduction atmosphere was maintained until the last 30 minutes at which time an oxidizing fire was used to complete the cycle. The maximum temperature was 2381° Farenheit determined by a pyrometric cone (cone 10 = 2381°) which can be observed bending toward the shelf by looking through the peephole at the side of the kiln.

Whiting: 20 and 40 per cent

20 per cent of whiting fluxed the base Albany slip causing a rather fluid streaked amber surface with a dark glossy base roll. (Tile 1.)

A 40 per cent whiting addition to Albany slip activated a rapid flow, forming fern-like movements toward a base roll settling to the kiln shelf. (Tile 2).

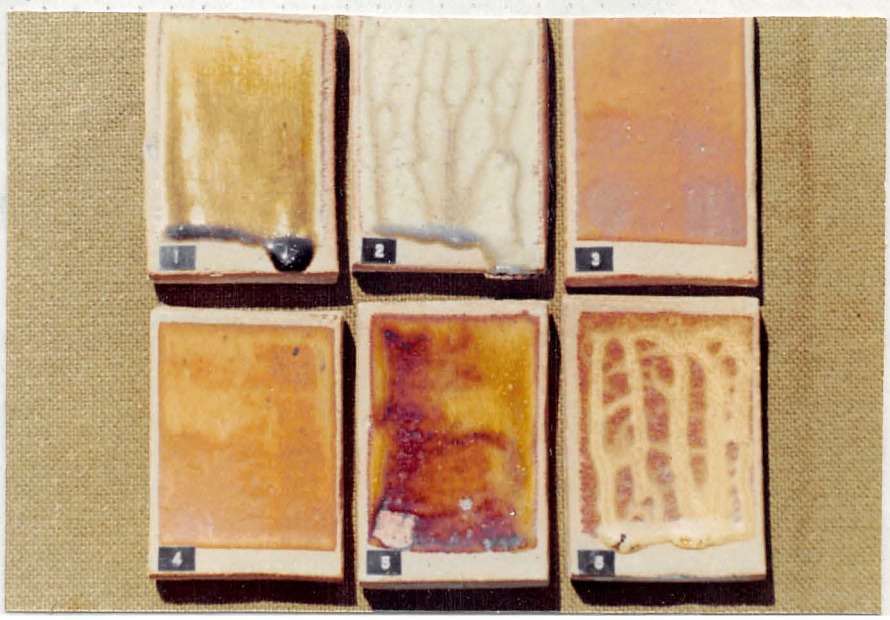


Fig. 1

Barium: 25 and 50 per cent

The addition of 25 per cent barium had little effect on the fluidity of the glaze; however, in color, a rich brown to tan emerged, (Tile 3).

Increasing the barium to 50 per cent increased the fluidity somewhat and enriched the surface through a mottled orange tan with body iron spotting, (Tile 4).

Dolomite: 20 and 40 per cent

Dolomite in the amount of 20 per cent increased the brightness of surface and developed a rich amber gloss, (Tile 5).

With the addition of 40 per cent dolomite a very irregular mottled tan, tree-like pattern evolved. The high gloss softened to a mat and a slight roll of glaze formed at the base of the tile, (Tile 6).

Colemanite: 25 and 50 per cent

Colemanite in the amount of 25 per cent ran off the tile, leaving behind an irregular mat and gloss spotted surface with a small glaze base roll, (Tile 7).

When the flux was increased to 50 per cent a dull orange brown surface remained while the greater portion of covering settled to the kiln shelf. Both quantities would be considered too active, (Tile 8).

Fig. 2

Borax: 15, 25 and 50 per cent

15 per cent borax creates a very pleasing, smooth, somewhat fluid surface. A rich reddish brown with black interspersed streaking and a viscous glaze roll developed on the tile surface, (Tile 9).

Raising the flux to 25 per cent washed out dark streaking and enriched the color tone considerably. Fluidity did not seem to be affected a great deal, (Tile 10).

50 per cent borax was far too active for cone 10; however, it may be attempted at lower temperatures, (Tile 11).

Talc: 20 and 40 per cent

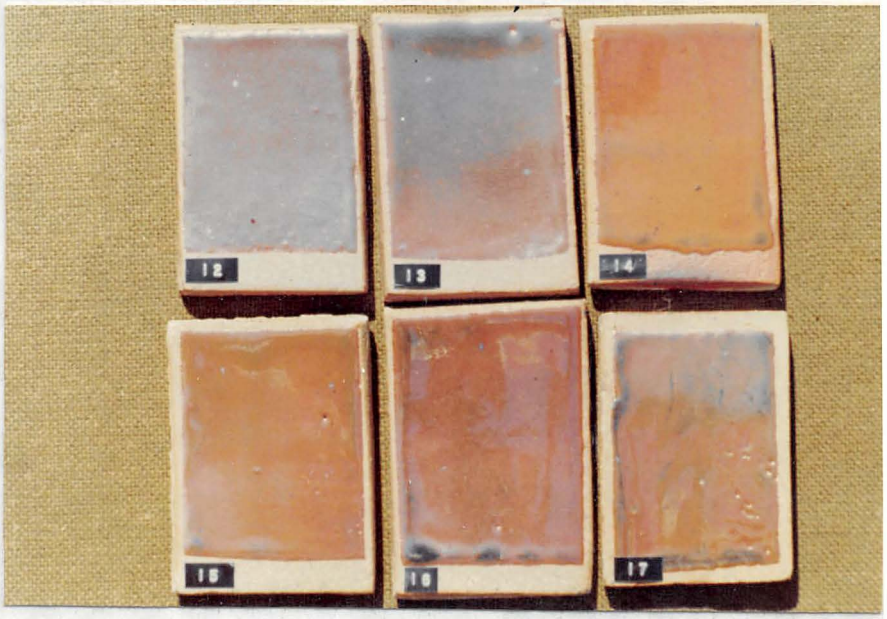
Talc in the amount of 20 per cent darkened Albany slip to a deep brownish red while a 40 per cent addition broke slightly to a metallic brown with black overtones at the thickest glaze areas, (Tiles 12 and 13).

Nepheline Syenite: 15 and 30 per cent

Nepheline syenite had little or no effect on glaze stability. The appearance of the glaze was a warm orange to brown hue, (Tile 14).

Raising the percentage of nepheline syenite had little or no effect on the stability of the glaze but changed the color to a slightly less intense orange-brown, (Tile 15).

Fig. 3



Cornwall Stone: 20 and 40 per cent

Cornwall stone in the amount of 20 per cent changes the appearance of Albany slip very little. Probably of greatest

significance was a raise in the fluidity of the glaze test, (Tile 16).

Doubling the quantity of cornwall stone appeared only to cast darker blemishes on the tile's surface, (Tile 17).

Wood Ash: 25 and 50 per cent

A mixture of soft wood ashes obtained at a box factory, sieved through 30 mesh screen and washed for a period of four hours, yielded the following results: 25 per cent was satisfactory in that it was generally stable and maintained a bright amber surface, (Tile 18).

When an increase of 50 per cent takes place, the mixture is much too active and flows from the tile resulting in a mat tan stony surface, (Tile 19).

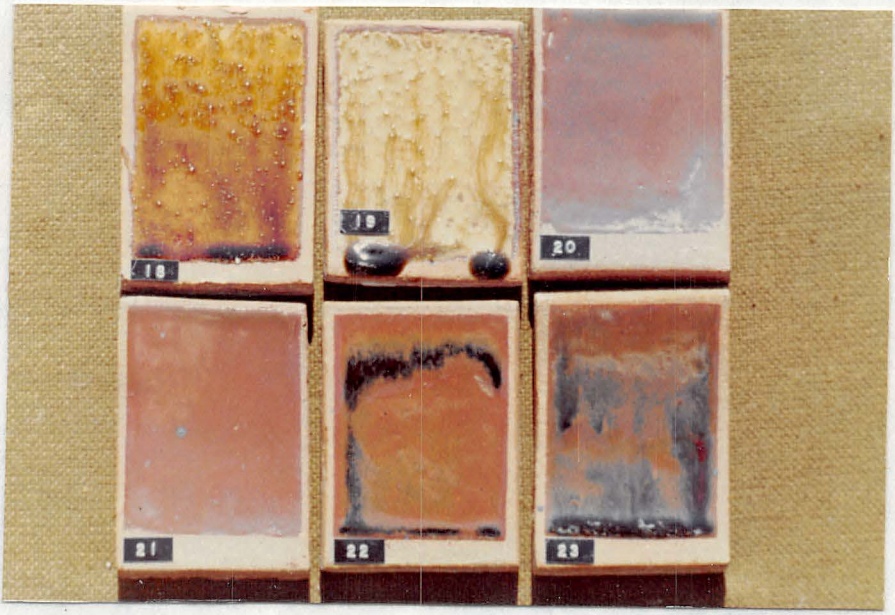


Fig. 4

Feldspar Potash: 20 and 40 per cent

With the addition of 20 per cent feldspar potash, only a slightly lighter change of color was noted. Increasing the feldspar potash to 40 per cent had little effect on the fluidity while a more significant color loss was evident, (Tiles 20 and 21).

3191 Ferro Frit: 25 and 50 per cent

Pleasing results were obtained with frit. Having somewhat the effect of borax, the appearance changes through small granular configuration and prominent settling or shifting bands, (Tile 22).

Following an addition of 50 per cent frit, the activity increases somewhat and a rich blue-black, mottled, streaked surface results, (Tile 23).

CHAPTER V

OXIDE COLORANTS ADDED TO ALBANY SLIP

In the following experiments, Albany slip will be used as a base to which a variety of general oxides will be added. Following the slip trail application of Albany stains, a covering of natural Albany slip was applied by dipping the fire clay base tiles. (Clay body "D")

The addition of black nickel oxide and green nickel oxide in the amounts of 10 per cent to a base Albany slip formed a slightly spreading charcoal mat trail, (Tiles 24 and 25).

Grouping according to color generalization and viscousity, manganese carbonate in the amount of 25 per cent and 25 per cent iron chromate developed similar surface crystals, (Tiles 26 and 27).

Fig. 5

Cobalt carbonate and cobalt oxide in the amount of 10 per cent react identically from the standpoint of color and crystalline action. Considered a somewhat stronger oxide, cobalt oxide exhibited a greater fluidity. (Tiles 28 and 29).

Light and dark tone rutile were compared in the following tests. Addition of 25 per cent was used in both cases, (Tiles 30 and 31). A very desirable gold crystal structure develops when placed beneath Albany slip. Rutile, when used as a stain, spreads equally in different directions despite the 45 degree angle of placement. A fine black feathery edge forms at the outer perimeter.

Fig. 6

Of greatest contrast (relating to the Albany slip background) were the tiles bearing green chrome oxide and synthetic iron chromate. 10 per cent of green chrome oxide permitted a sharp contrasting line, while 25 per cent of synthetic iron chromate remained very dark and the edges diffused slightly. (Tiles 32 and 33).

The remaining experiments selected contained 25 per cent of powdered ilmenite and vanadium pentoxide. (Tiles 34 and 35).

The crystalline action conformed to an interesting organized pattern and formed somewhat of a halo around the perimeter areas. A most unusual result was the vanadium pentoxide experiment. The closest description of color is a mottled pink, outlined by a feathering action reaching out far beyond the original decorative flow. Whether one could depend upon the fluidity of this stain on a vertical wall is questionable; however, somewhat flat surfaces could be interesting.

CHAPTER VI

ALBANY SLIP COMBINED WITH SEVEN SEPARATE GLAZES

In this chapter 50 and 75 per cent of Albany slip plus 1 of 7 glazes will make up a 100 gram glaze batch and will be placed on fire clay base tiles, (Clay body "D")

River Stone: 25 and 50 per cent

Albany slip dominates the mixture of 25 per cent river stone and a very deep brown gloss surface emerges, (Tile 36).

However, the mat quality of river stone overpowers the stable Albany slip when equal parts are combined. A mat surface of a somewhat tan overcast, evolves, (Tile 37).

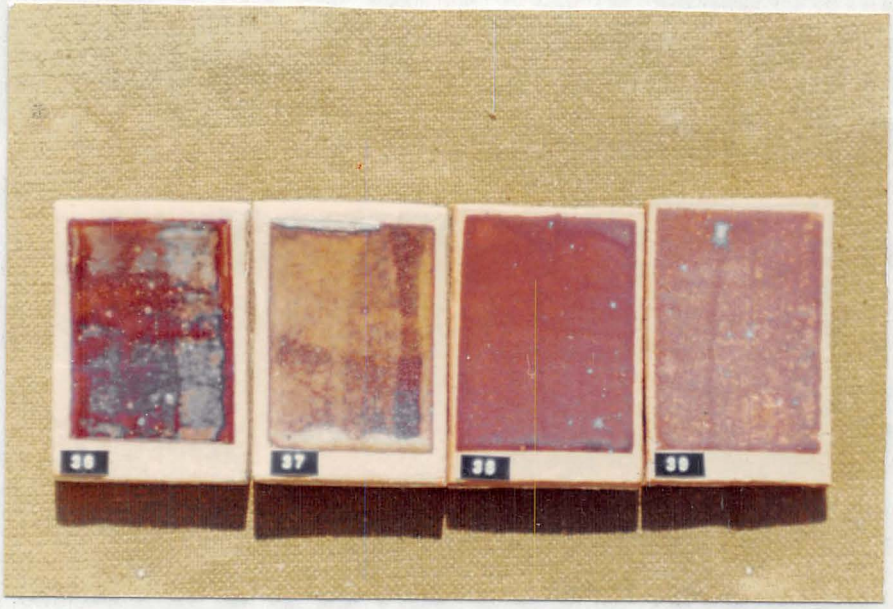


Fig. 7

Subtle Yellow: 25 and 50 per cent

The presence of rutile and green chrome oxide form a subdued, even, tobacco brown, somewhat less glossy than the other glazes tested. (Tile 38).

When 50 per cent of subtle yellow glaze is present, a soft light brown results and the clay quality emerges through the glaze. (Tile 39).

Ash: 25 and 50 per cent

When 25 per cent ash glaze is added to Albany slip an unusual green to brown blemished surface develops. Iron present in the clay body bleeds through to further dapple the bright surface. (Tile 40).

When an equal mixture of Albany slip and ash glaze is used a transparent yellow-green glaze results along with orange spotting due to the iron in the clay body. (Tile 41).

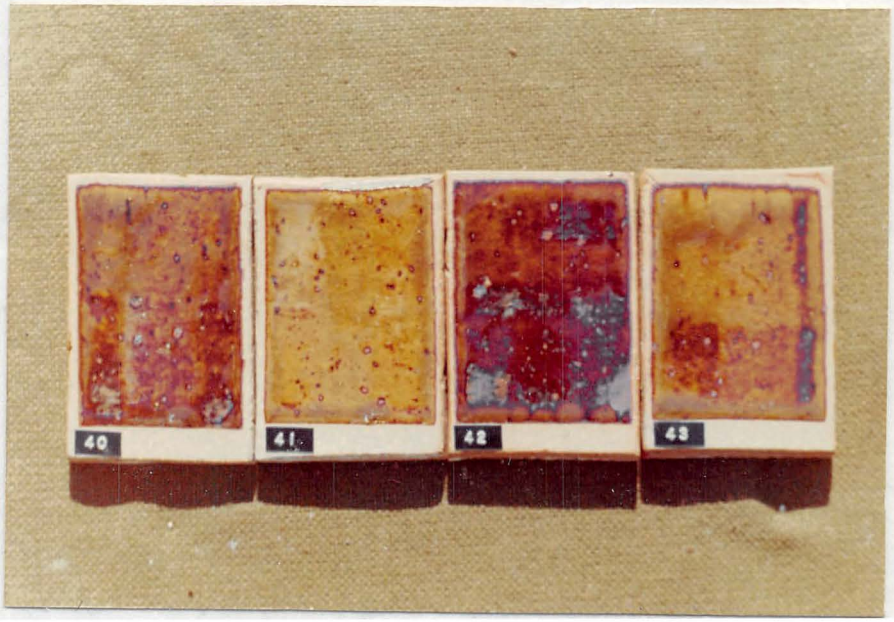


Fig. 8

Cornwall Stone: 25 and 50 per cent

In the amount of 25 per cent, cornwall stone glaze allows the Albany slip to form blemishes varying from deep brown to amber, (Tile 42).

When the cornwall stone is increased to 50 per cent a bright transparent green dominates the surface, (Tile 43).

Stone Mat: 25 and 50 per cent

A marked similarity exists between cornwall stone and stone mat glaze. A deep brown forms when 25 per cent stone mat is used while 50 per cent permits an overall iron spotting through a glossy yellow green, (Tiles 44 and 45).

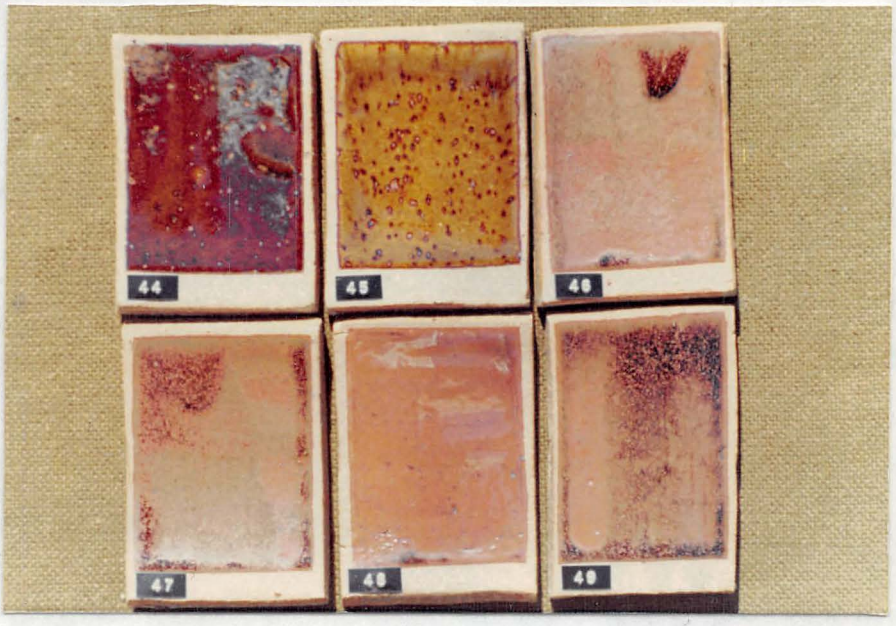


Fig. 9

Soft Yellow Red: 25 and 50 per cent

When 25 per cent of soft yellow red is added to Albany slip, a light rust color forms with some mottled areas evident, (Tile 46).

An increase of the soft yellow red to 50 per cent, lowers the melting point slightly and areas of thick application shift, developing a handsome mottled reddish brown surface, (Tile 47).

Soft Red: 25 and 50 per cent

With 25 per cent soft red glaze, the surface flows smoothly and variations are eliminated. Thinness of application may have placed a limitation on the color, in this case a medium brown, (Tile 48).

Half slip and half glaze results in a slightly fluid combination. An overall surface mottling developed in tones of deep brown to an orange cast, (Tile 49).

CHAPTER VII

VARIED SURFACE TREATMENTS ON THREE STONEWARE CLAY BODIES

The following chapter is concerned primarily with physical surface treatment of 3 clay bodies. A myriad of surface alterations can be achieved with an imaginative flair. However, altering of the clay surface will be facilitated by the use of common clay working tools. The experiments are grouped by clay bodies for the sake of comparison.

A square ended sculpture tool was used to make a repetition of cuts in a decorative band on the tile. A single coating of Albany slip was poured over the tile surface. (Clay body "A"). It resulted in a dark pooling of glaze in the deepest part of the cut while at higher elevations it remained light in tone. (Tile 50).

Fig. 10

Clay body "B" pooled in the depths of a decorative cut when Albany slip is poured over the tiles surface. The contrast, however, of color is overpowered by the 8 per cent iron content. (Tile 51).

Clay body "C" is a natural stoneware base body exhibiting a similar effect to clay body "A" with the exception of a lighter appearance. (Tile 52).

A variation of the base glaze by an addition of 1 per cent cobalt oxide and 5 per cent manganese carbonate developed a black glaze bearing crystalline highlights when placed on clay body "A" and "C". (Tiles 53 and 54). With the cobalt and manganese in contact with the iron saturated "B" clay body, an iridescent charcoal appearance was achieved. (Tile 55). One would have to be quite selective in the forms used when applying this glaze.

Impressions from a loop-ended sculpture tool in a soft clay decorative stamp for the purpose of low relief impressed patterns were favorable. Again clay body "A" and "C" responded satisfactorily while clay body "B" obscured the decorative contrasts. (Tiles 56, 57 and 58).

The Korean mishima technique was employed and porcelain clay inlaid beneath the clay tile surface. From this experiment a rather unusual effect was noted. On "A", "B" and "C", the white porcelain, which might be expected to appear lighter through the transparent

Fig. 11

Albany slip, converts instead to a shiny well defined black. Very interesting results could be expected upon pursuing this technique in relation to a decorative motif, (Tiles 59, 60 and 61).

A 3 dimensional effect can be worked out by a variety of paper and or fabric saturated in stoneware clay slip. The soft paper/clay media can be manipulated and arranged in a somewhat unusual formation. Upon firing, the fiberous materials burn out early in the process, casting the near prototype formation in clay.

The first two tiles glazed were based upon Albany under a stone mat magnesia glaze and Albany over a stone mat magnesia glaze with clay body "D", (Tiles 62 and 63). Albany under stone mat magnesia blends very well and forms vertical streaking while Albany over stone mat magnesia permits a translucent deep reflective amber. High portions of

the three dimensional formation lighten in color as the glaze settles to the tiles surface.

Fig. 12

A blue ash glaze placed over Albany slip on clay body "D" yielded a subdued grey to grey-green and became somewhat fluid settling in a roll at the base of the tile. (Tile 64).

When Albany slip is used on clay body "D" it is not as effective as the combination glazes previously used. (Tile 65).

An addition of 50 per cent and 25 per cent of wood ashes were among the more interesting tiles on clay body "D". With 25 per cent wood ash a mottled yellow amber to brown with dapplings of gloss formed. (Tile 66).

The presence of 50 per cent wood ash left an unusual and

irregular tan to brown mat surface, (Tile 67).

When the stone mat magnesia glaze was placed over a coat of Albany slip, a rather mottled tan surface with a beginning development of oil spotting formed at the outer edges. Variations between clay body "A" and "C" were of no great significance, (Tiles 68 and 69).

Fig. 13

A bold pattern cut from paper, acting as a stencil and permitting only the negative areas to accept glaze, constituted the following experiments.

Clay body "A" accepts the deposit of two layers of glaze and a clear definition of line results, (Tile 70). When the identical process is carried out on clay body "B" a pleasing subtle green quality appears on an iridescent metallic background,(Tile 71).

The potter's hands when drawing up clay on the potter's wheel makes pronounced throw rings. Prior to the final shaping movement, Albany slip was brushed on the pot and emerged in spiralling movements from base to lip.

Clay body "A" and "B" maintained a glossy brown spiral while clay body "C" was rather dry and mat, (Tiles 72, 73 and 74). For certain glaze techniques such as transparent glazing and salt firing, this process may be useful.

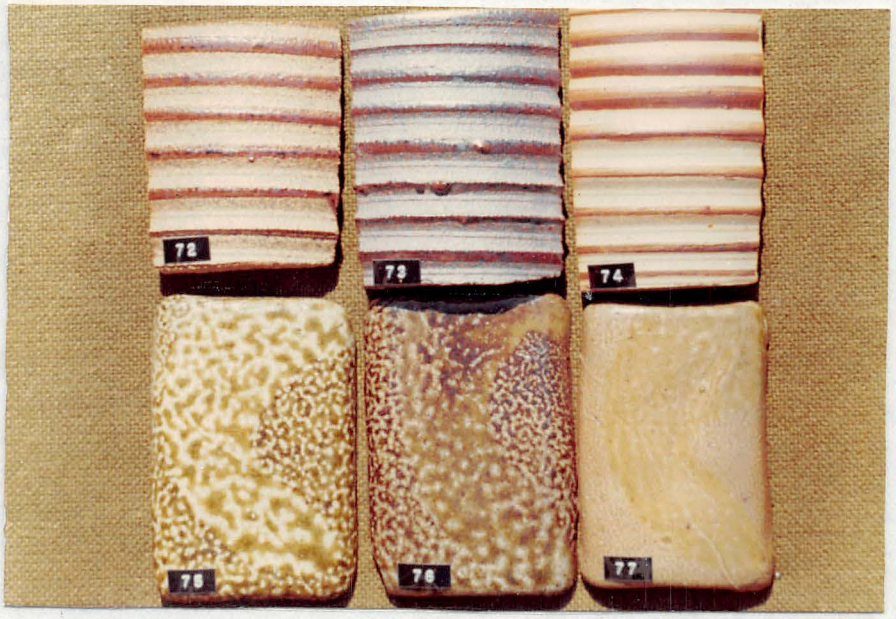


Fig. 14

Of great interest has been the process of salt glazing. A brush of Albany slip on clay body "A", "B", and "C" formed interesting results, (Tiles 75, 76 and 77). Clay body "B" darkened the Albany slip considerably and formed dark brown mottlings across the tile's surface. Clay body "A" had green configurations and permitted a more distinct

outline of the brush decoration. Clay body "C" was unacceptable in that the brushwork of Albany slip did not develop a distinct pattern. Obviously, iron present in the clay body aids in the formation of interesting surface configurations.

CHAPTER VIII

STAINED PORCELAIN SLIP APPLICATION ON BISQUE STONEWARE SURFACES

Experiments incorporating liquid porcelain slip with addition of metallic oxides and several commercial stains will be discussed in this chapter. The porcelain slip preparation is as follows:

7	Ball Clay
7	Kaolin
7	Feldspar (Potash)
5	Flint

Two commercial stains (orange stain 1349-A), (yellow stain 1359-C), from the Ceramic Color and Chemical Company were incorporated into a base porcelain slip.

Orange stain in the amount of 10 per cent developed a handsome but subtle variation when covered with 50 per cent Albany slip and stone mat magnesia glaze. (Tile 78).

A somewhat darker decorative area results when the stain percentage is raised to 20. (Tile 79).

With the addition of 10 per cent yellow stain to the porcelain base, a lighter celadon develops while an increase to 20

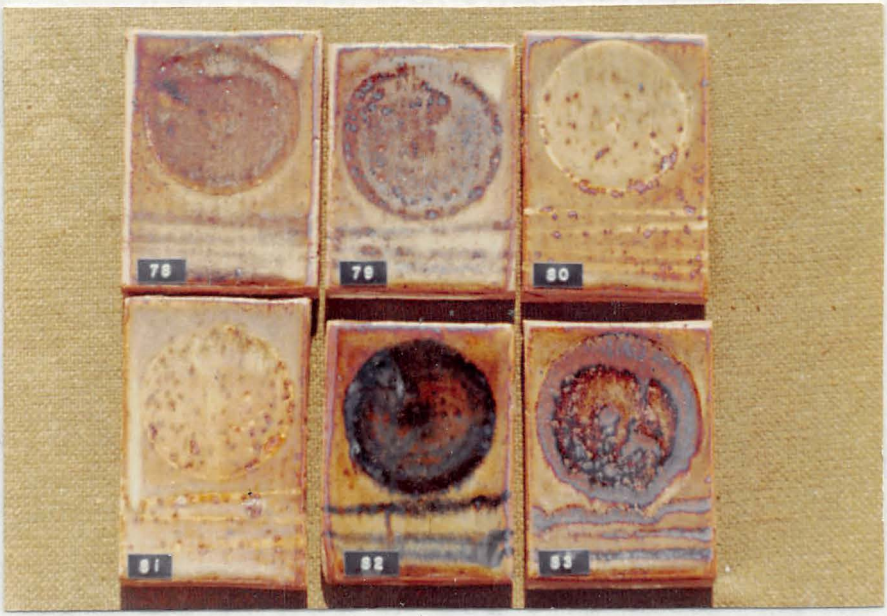


Fig. 15

per cent reverts back to a rutile tan cast, approaching a mat surface, (Tiles 80 and 81). Placement in the kiln may have a bearing on these results.

The quality of surface from a bright translucent standpoint is excellent when 20 per cent manganese and 5 per cent cobalt is applied wet to a bisque tile and glazed with equal parts Albany slip and stone mat magnesia glaze, (Tile 82).

Again in combination with Albany slip and stone mat magnesia base glaze an exceptional surface configuration and lucid depth of color results when 12 per cent of powdered ilmenite and 12 per cent rutile are combined, (Tile 83).

A considerably more subtle result is arrived at by the addition of 5 per cent cobalt oxide applied under Albany slip and

stone mat magnesia glaze, (Tile 84). A nearly mat surface permits soft clarity of line somewhat removed from previous tiles.

Stone mat magnesia and Albany slip, in combination with 5 per cent cobalt oxide, 40 per cent iron and 15 per cent manganese foster the development of iridescent charcoal crystals on a streaked semi-mat background, (Tile 85).

25 per cent green chrome oxide and porcelain slip produce a very subtle result. The surface tends to mat when covered by Albany and magnesia glaze, (Tile 86).

Fig. 16

A combination of 5 per cent green chrome oxide and 2 per cent cobalt oxide under the Albany and magnesia glaze produce a deep blue turquoise with rich background mottling, (Tile 87).

A great deal of surface fluidity is evident when 25 per cent

rutile and 25 per cent ilmenite is combined with mat stone magnesia glaze and Albany slip, (Tile 88).

Soft red glaze brushed over a 10 per cent green chrome oxide decoration shows through a final coating of Albany slip. A vague decoration results beneath the reddish brown overcast dappled by reflective minute pools, (Tile 89).

CHAPTER IX

BISQUED ALBANY SLIP DECORATION ON A PORCELAIN BODY

Clay body "E", a white porcelain, offered an unusual development for glazes, stains and slip.

Albany slip was applied to the tile and covered with 25 per cent ash glaze combined with 75 per cent Albany slip. Results proved interesting with an amber to yellow surface, (Tile 90).

When 25 per cent subtle yellow glaze was added to Albany and brushed over a bisque Albany decoration the porcelain maintained a very favorable streaked mid-brown reflective quality through the surface coat, (Tile 91).

Fig. 17

Ten per cent cobalt carbonate combined with Albany slip

formed a pleasing iridescent design beneath a single coat of natural Albany slip, (Tile 92). In many ways it looked like Albany and nepheline syenite.

Cornwall stone glaze formed the covering over Albany slip and 10 per cent black nickel oxide, (Tile 93). The light tan to brown appearance is somewhat subdued.

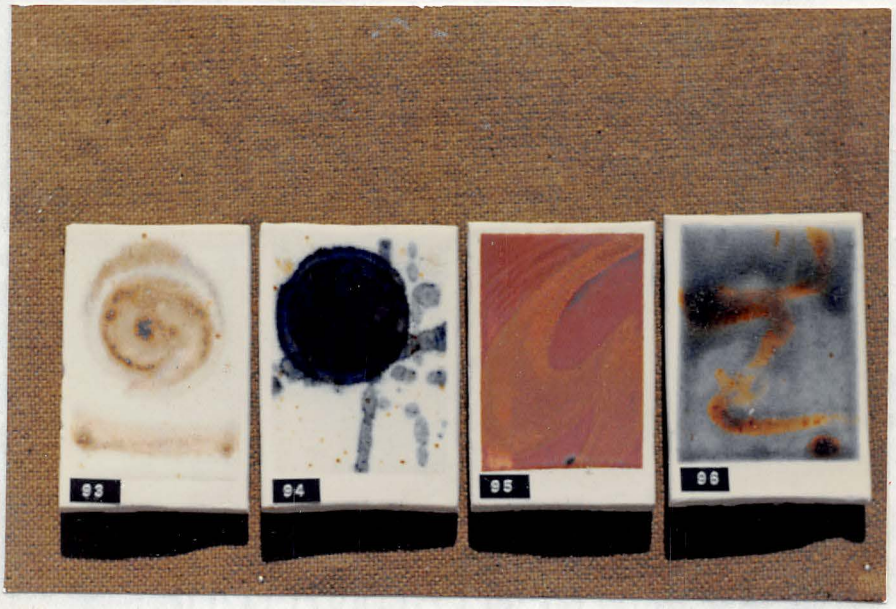


Fig. 18

With 10 per cent of cobalt oxide present in an Albany slip base, a strong deep blue developed under a transparent ash glaze, (Tile 94). One would have to be discerning in the use of this strong blue stain technique.

Albany slip combined with light rutile in the amount of 25 per cent brushed on a porcelain clay body and covered with a thin layer of natural Albany slip developed a pleasingly subtle contrast of orange to light orange, (Tile 95).

The soft blue ash glaze brushed over an Albany slip decoration reduced the brown to a subtle green amber. (Tile 96). The transparent quality of this glaze in relation to Albany slip is generally successful.

The following porcelain tiles have had an addition of iron particles wedged in the initial porcelain clay body.

Upon the addition of 25 parts soft red glaze to Albany slip, applied by fan brush, as a decorative stroke and an overall covering of cornwall stone glaze, the design was lost to the overactive iron particles bleeding through. However, a most interesting varigated surface in hues of a reddish mottled quality breaking to light green results. This glaze would be reserved for unusual forms. (Tile 97).

Fig. 19

Albany with 25 parts ilmenite and 25 parts rutile brushed over a porcelain clay body and covered with stone mat glaze produced a warm

textural surface, (Tile 98).

Vanadium pentoxide in the amount of 25 per cent combined with Albany slip and brushed on the tile with short strokes under a stony mat glaze represented one of the most unusual varigated surfaces, (Tile 99).

The red plum glaze placed over an Albany design resulted in a pleasing celadon breaking to a medium brown pattern, (Tile 100). The consistency of this combination would be compatible for most porcelain forms as compared to earlier experiments with iron added.

CHAPTER X

BASE GLAZE STAIN BRUSHED ON AN ALBANY SLIP SURFACE

This chapter deals with various studio glazes functioning as a base for stain development.

For indication of results as an underglaze and overglaze the stain brush work will consist of one application on the bisque tile followed by a second application over the final base glaze.

The first series of 4 tiles involve soft red glaze over Albany slip.

Fig. 20

With 10 per cent green chrome oxide combined with soft red glaze a pleasingly mottled surface with red iron spots bleeding through the surface stain results. When placed under the Albany and soft red

glaze, a soft yellow tan developed with little or no red spotting evident, (Tile 101).

With an addition of 25 per cent dark rutile to soft red little difference is noted between under and over decoration, (Tile 102). This combination is very active and diffuses considerably.

Ten per cent cobalt oxide and soft red glaze tends to over-activate the base slip and glaze; however, a rather acceptable crystalline formation does result, (Tile 103). A nearly identical effect is achieved by the use of 10 per cent cobalt oxide and 25 per cent manganese, (Tile 104).

River stone glaze is a very dry mat and when used in conjunction with green chrome oxide, a very soft, somewhat vague decoration is achieved in both under and over glazing, (Tile 105).

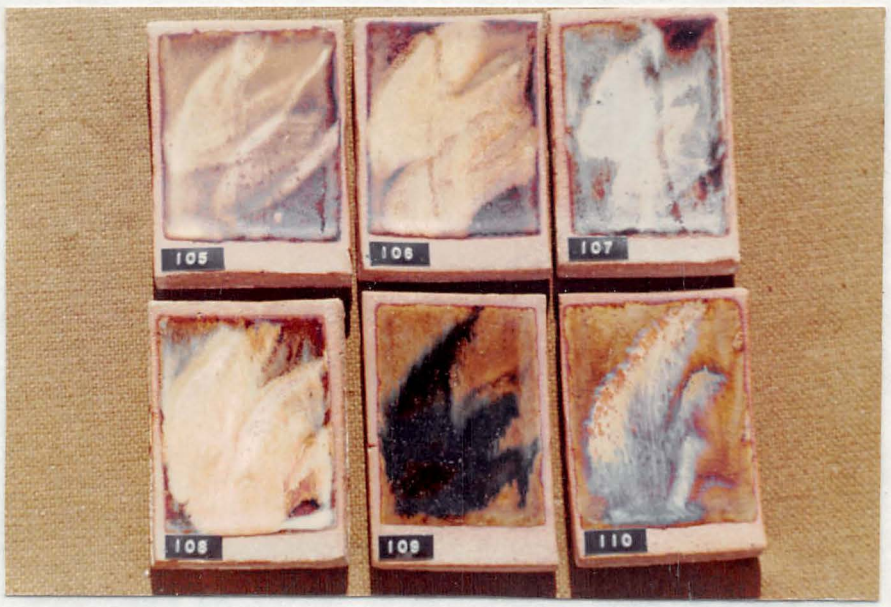


Fig. 21

The addition of 25 per cent rutile to river stone glaze flows somewhat; however, the effect is interesting, (Tile 106). Barium base glaze is used in the following two tiles. Green chrome oxide combines with the barium glaze to develop a mat surface and form vertical drifts, (Tile 107). When a 25 per cent rutile stain is placed under and over the glazes a fluid "painting-like" formation develops, ranging from tans to pinks and a host of other colors, (Tile 108).

Wood ashes form the base of the following two glazed tiles: 25 per cent manganese and 5 per cent cobalt oxide are added to the ash glaze forming a deep navy blue, while 25 per cent dark rutile breaks from mat orange to vertical streaked light blues and tans, (Tiles 109 and 110).

A cornwall stone base glaze is represented in the following 3 tiles.

Very distinct differences occur when 10 per cent green chrome is present in the cornwall stone base. As an underglaze the stain converts to a mid-brown and when applied as an overglaze, a subtle lavender develops, (Tile 111).

Cobalt oxide in the amount of 10 per cent as an under glaze subtly breaks through the surface with mat and gloss featherings, (Tile 112).

Fig. 22

Dark tone rutile has a surprising effect on cornwall stone base glaze. From beneath, a dappled pink rises to the surface, while an over glaze tends to slide and form a gentle roll at the base. (Tile 113).

CHAPTER XI

CONCLUSIONS

Experimenting with Albany slip as a base for the development of new glazes and stains has been a rewarding and stimulating experience for the writer. Using this material available to students of ceramics and combining it in various proportions with common glaze elements, produced a large number of acceptable results included in this report. Chemical additions were selected on an impartial basis so as to avoid preconceived ideas regarding the results. The slip glazes tests are of a general nature and in no way set limitations for further variations. Of great interest to the writer is the wide firing range of Albany slip. With the selection of clay bodies and base glazes for cone 6 to cone 12, the results of this report can be expanded to accomodate the reader and his needs.

Photographs and detailed descriptions in this paper are for the assistance of the reader. The mounted tiles are the property of the ceramics studio of the Art Department, University of Minnesota, Duluth, and are available for closer inspection.

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